STANDARDS DEVELOPMENT BRANCH OMOE
3 6936 00000 2387

Suggested Use of Methyl Bromide Procedures for Greenhouse Fumigation

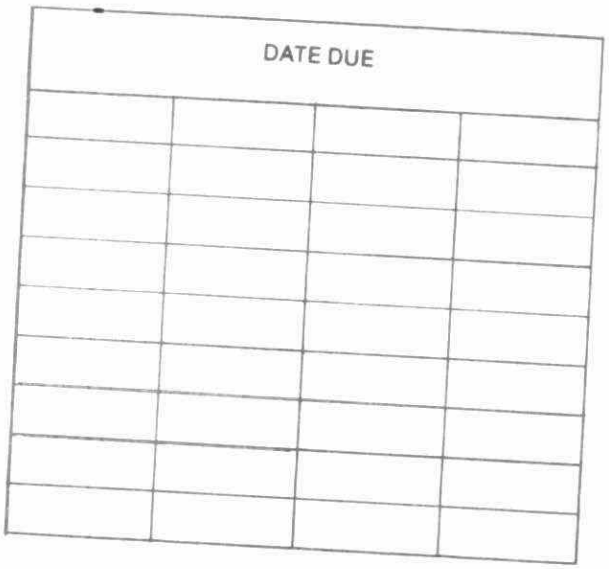
SB
952
.B7
O57
MOE

Ontario

Ministry of the Environment

Hon. J.A.C. Auld
Minister

Everett Biggs
Deputy Minister



SB
952
.B7
O57

Suggested use of methyl
bromide procedures for
greenhouse fumigation /

76008

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact Service Ontario Publications at copyright@ontario.ca

SB
952.B7
057

SUGGESTED USE OF METHYL BROMIDE PROCEDURES

FOR

GREENHOUSE FUMIGATION

PESTICIDES CONTROL SERVICE

MINISTRY OF THE ENVIRONMENT

INTRODUCTION

Methyl bromide is a substance which, when used for an extermination in the Province of Ontario, requires, under the Pesticides Act and Regulations, that the applicator be licensed.

Because it is colourless, practically odourless and tasteless it is not apparent to the operator when a toxic atmosphere is encountered. As a result, some cases of methyl bromide poisoning have occurred from fumigation with methyl bromide. During the last few years the use of methyl bromide has gained popularity in North America.

The physical characteristics of methyl bromide make it especially adaptable for soil fumigation in greenhouses. Since this type of fumigation is different from a space fumigation, it has been deemed advisable to prepare a short pamphlet on the procedures to be used.

Editor.

PHYSICAL PROPERTIES OF METHYL BROMIDE

Common Name	Methyl Bromide
Formula	CH_3Br
Commercial Grades	Not less than 99.5% pure
Physical State	Gas at normal temperature and pressure. Liquid under pressure in cylinders or cans at normal temperature.
Flash Point	Practically nonflammable
Flammable Limits	10-15.4% in air with source of ignition.
Critical Temperature	381.2°F (194°C).
Boiling Point	40.1°F (4.6°C) at 760 mm. Hg.
Freezing Point	-135.4°F (-93°C).
Colour	Colourless
Corrosivity to Metals	Not particularly corrosive to most metals. Non-corrosive when dry. However, it attacks aluminium and magnesium and their alloys. For example, it attacks aluminium with the formation of aluminium trimethyl, a spontaneously ignitable material.
Odour	Odourless except for relatively high concentrations which have a sweet, chloroform-like odour.
Solubility	Less than 0.1 part in 100 parts of H_2O at 25°C. Soluble in some of the organic solvents.
Specific Gravity of Liquid	1.732 gm/ml at 32°F (0°C).
Specific Gravity of Gas (Air = 1)	3.27 at 32°F and 14.7 A.P.
Threshold Limit Value (Skin)	20 ppm or 80 mg/cu. met. (ACGIH-1967).

It should be stated at the beginning that methyl bromide is only one of several methods that can be used for soil sterilization in a greenhouse. It is efficient and simple to use provided a person has all the equipment necessary and follows out the procedure in proper sequence. If a variation is made in the latter it is only an invitation for an accident. Because of the toxic nature of methyl bromide you cannot afford an accident.

Equipment Needed

1. Polyethylene tarp or similar plastic tarp.
2. Polyethylene tubing 1/8-in. diameter.
3. Gas mask - full face piece (industrial) plus canister approved by U.S. Bureau of Mines for methyl bromide.
4. Halide leak detector.
5. Metal trays to be used as evaporators.
6. Stones, weights, etc. to be used to anchor one end of tubing in the evaporator trays.
7. Something to keep the tarp suspended at least 6-in. above the soil surface. This could be 1" x 2" strapping supported by stakes horizontally down the middle of the bed, or up-ended flower pots, crumpled fertilizer bags; racks filled with hay, etc.
8. A Jiffy applicator - may be obtained from your supplier of methyl bromide.
9. One assistant.
10. Locks for the door or doors.
11. Signs - 14" x 10" wide, saying a dangerous gas is being used inside.
12. Masking tape to seal leaks in tarps.

There are two common procedures used. One is where the flats are stacked in a pile and fumigated, the other is where the bed is fumigated as is, on the ground. In both cases the procedure is very similar and certain conditions are the same, i.e. the soil should be loose and not compacted, the soil should be 60°F. as a minimum and the methyl

bromide must be heated to about 60° to 70°F. This may be done by immersing the 1-lb. cans in hot water.

Procedure

Beds

(a) A trench is made between the bed and the side of the greenhouse about 8" to 10" deep.

(b) One edge of the tarp is placed in the trench and the earth tamped in tightly.

(c) Supports are placed down the centre of the bed in order to keep the tarp suspended at least 6-in above the soil.

(d) Evaporating trays are placed in the middle of the bed. If the rate of application is 1-lb. per 100 sq. ft., one tray should be placed for every 100 sq. ft. If the rate is 1½-lbs. per 100 sq. ft., place a tray about every 66 sq. ft. Note : the square footage is obtained by multiplying the width of the bed times the length. Therefore, if you were applying 1-lb. per 100 sq. ft. and the bed was 4 ft. wide. You would place an evaporating tray every 25 ft. of bed.

(e) Take a piece of 1/8-in. tubing of sufficient length to reach easily from the evaporating tray to the outside of the bed. Affix one end in the evaporating tray by means of the weight or stone (item 7 in equipment needed).

(f) Make a smilar trench 8" to 10" deep in the ground on the corridor side of the bed. Put the other edge of the tarp in this trench and tamp the earth down tightly. In doing this operation make sure the tarp is taut over the bed, allowing for good movement of the gas between the tarp and the bed. The end of the 1/8-in. tubing should be easily accessible outside this side of the tarp but with the earth well tamped to give a good seal. Do it likewise at each end of the bed.

(g) You are now ready to release the gas. Taking into consideration the necessity of maintaining a sufficient temperature in the greenhouse if possible, the doors should be open during the release of the gas.

(h) The gas mask should be put on by the exterminator at this stage and with the assistant standing at the door in case of an accident, the exterminator by means of the Jiffy applicator

will release one lb. of methyl bromide through each piece of tubing. When the gas has gone into the evaporating tray the tubing will be pulled out and the hole under the tarp sealed by earth.

(i) When all the gas has been released and the tubing removed, the exterminator with the gas mask still on, will take the halide leak detector and; (1) test the edges for leaks; and (2) test the tarp itself for pin hole leaks. Any leaks must be sealed immediately. Leaks around edges may be sealed by tamping down the earth more efficiently. Leaks in the tarp may be sealed by covering with masking tape.

(j) The exterminator now leaves the greenhouse and the doors are locked. The keys to the doors are kept in the possession of the exterminator. Signs are affixed to the outside of the door.

Airing Out

The exposure period may vary from 24 hours to several days depending on the concentration of gas and the temperature. The steps in sequence for airing out are as follows :

(a) With his gas mask on, an assistant standing by, the exterminator will open the doors and ventilators of the greenhouse.

(b) He should check the greenhouse with the halide leak detector to see if by chance there is a build up of methyl bromide. If none is evident, he will proceed to the next step.

(c) With his gas mask still in place, he will remove the tarp being careful not to damage it, so that it may be used for another season or other beds.

(d) He will now check the fumigated bed to see if there is any sign of gas. He will keep the greenhouse under his custody and control until the halide leak detector shows no evidence of gas.

Flats

When flats are piled for the purpose of fumigating the soil, they should be piled loosely to allow good permeation by the gas. The tarp should be suspended approximately 6" above the top and an evaporating

tray and plastic tubing placed at the top, similar to the method detailed for bed fumigation. The edges of the tarp may be sealed in earth, similar to bed fumigation, or if it is being done on a concrete floor, snakes may be used to hold the tarp down. Note : A snake is a long cylindrical bag (about 6" to 8" in diameter) filled with sand. The size of the piles should be about 1000 cu. ft. as the dosage rate is 1 to 2 lbs. per 1000 cu. ft. All other procedures and precautions should be the same as in bed fumigation.

Gas Mask

The gas mask is your own personal protective equipment. The face piece should be a properly fitting industrial "face piece". Surplus war face pieces are not recommended. The canister should be one that has been approved by the U.S. Bureau of Mines, for use with methyl bromide. Your safety equipment dealer will ensure that you get the proper canister, if you ask him.

Your gas mask and canister, as stated above, are for your personal protection. They are only as good as the care you take of them. It must be remembered that the life of a canister depends on the concentration to which it has been exposed, and the length of time of the exposure. It is a good practice to keep a card on each canister. Each time the canister has been used, the length of time should be entered on the card. When the time of use of the canister has been accumulated to a total of one hour, a fresh canister should be attached and the old one be discarded.. When not in use, the gas mask and canister should be stored in a cool dry place with the canister sealed.

Halide Leak Detector

This is a very important piece of equipment to a person using methyl bromide. Always remember that if the gas is detectable with your halide leak detector, it is not safe for any person to be in the area without a proper gas mask. There is more sophisticated testing equipment available, but for your purpose, the halide leak detector is quite adequate. The halide leak detector in concentration of 30 ppm of methyl bromide will show a green flame. The operator should not remain in the area where methyl bromide is present.

SUGGESTED DOSAGE TABLE

Control Desired	Type of Soil or Material	Dosage	Minimum Exposure Time	Aeration Time Before Seeds
Nematodes, insects and weed seeds	Plant beds, turf and other local areas	1-lb. per 100 square feet	24 hours	48 hours
	Well-rotted compost, manure and top soil	½-lb. per cubic yard	24 hours	72 hours
	Mulching straw or hay	1-lb. per 4 bales	48 hours	24 hours
Damping-off organisms such as species of phthium, Rhizoctonia and fusarium	Plant beds and other local areas	2-lbs. per 100 square feet	24 hours	72 hours or longer
	Decomposed compost and manure	1-lb. per cubic yard	24 hours	72 hours or longer

DETECTION CHART OF METHYL BROMIDE

Methyl Bromide Present Parts per Million	Pounds per 1000 cu. ft.	Flame Color in Daylight*
0	0	No color
25	0.00625	Faint fringe of green
50	0.0125	Moderate green
125	0.031	Green
250	0.0625	Strong green
500	0.125	Strong green-blue fringe
800	0.20	Strong blue green
1000	0.25	Blue

*Note that in using the gas detector at night the flame has a bluish cast which has to be taken under consideration, otherwise the color changes are the same.

Toxicological Data

Although methyl bromide is a very useful and effective fumigant it is also, unfortunately, very toxic to man and animals. It is highly volatile (boiling point 40°F.) and, for all practical purposes, odourless. It is not absorbed through the skin, although the liqud form may burn. It is said to be cumulative in action on humans.

Symptoms may not show up until 48 hours after exposure. The symptoms are headache, dizziness, nausea, vomiting and perhaps convulsions. Edema of the lungs may follow these symptoms. If death follows exposure to methyl bromide, it is usually from edema of the lungs. Death may occur up to six months after the exposure. Convalescence may be long and drawn out. If a person is overcome or shows symptoms of methyl bromide poisoning, he should be removed from exposure immediately. Keep the patient warm and call a doctor. If the patient stops breathing administer artificial respiration until a doctor arrives and takes charge. The booklet containing procedure for "First Aid and Treatment for Methyl Bromide Exposure" should be given to the doctor who takes charge of the patient. This booklet is available at your local dealer or Dow Chemical Company. However, it should be supplied by the dealer with each sale of methyl bromide.

SB
952
.B7
O57

Suggested use of methyl bromide procedures for greenhouse fumigation /
76008